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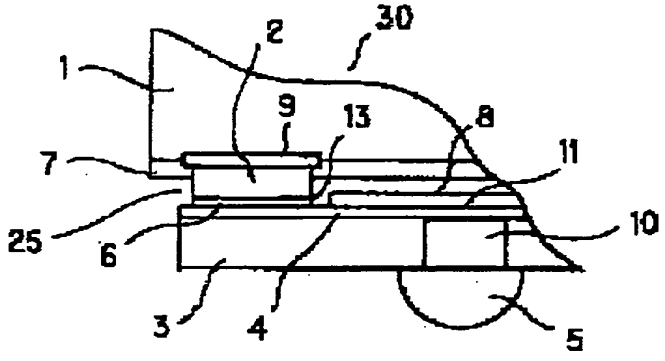
(54) TAPE WITH BALL TERMINAL AND SEMICONDUCTOR DEVICE USING THE TAPE

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a tape with ball terminals and a semiconductor device using the tape which attempts to eliminate sealing in sealing resin and to minimize, to reduce a cost and to improve a junction strength of a semiconductor chip.

SOLUTION: This device is comprised of a polyimide film 3 which has a size which is the same as or smaller than that of a mounted semiconductor chip 1, a junction pad 6 for junction of the semiconductor chip 1 formed on the surface of the film 3, a ball forming pad 11 which is junctioned by the junction pad 6 and an inducing lead 4 and a ball terminal 5 which is formed on the rear surface of the film 3



the rear surface of the film 5 and is junctioned via the ball forming pad 11 and a via hole 10. The device is junctioned with the semiconductor chip 1 by performing tin plating 13 on the surface of the junction pad 6 and by forming gold-tin common crystal alloy on the junction boundary surface via a gold bump 2.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the semiconductor equipment using the tape with a ball terminal and it which connect a semiconductor chip and a wiring pattern by the golden-tin eutectic alloy especially about the semiconductor equipment using the tape with a ball terminal and it which have a wiring pattern for connecting a semiconductor chip.
[0002]
[Description of the Prior Art] There is what is shown in JP,8-181169,A as semiconductor equipment which used the conventional wiring substrate with a ball terminal.
[0003] The semiconductor equipment which used the conventional wiring substrate with a ball terminal is shown in drawing 9 . This semiconductor equipment 30 is equipped with the closure resin 15 which closes a semiconductor chip 1, the wiring substrate with a ball terminal 31, and a semiconductor chip 1 and the wiring substrate with a ball terminal 31.
[0004] The wiring substrate with a ball terminal 31 has the ball terminal 5 prepared on the tin plating 13 which was wired in the field (following "rear face") opposite to the loading side (following "front face") of the semiconductor chip 1 of the wiring substrate 14 of a size bigger than the semiconductor chip 1 carried, and the wiring substrate 14, and which pulls out and was performed on the lead 4 and the cash-drawer lead 4, and the tin plating 13, and the insulating wiring protective coat 8 which protects the cash-drawer Moreover, the beer hole 10 which penetrates the wiring substrate 14 is established in this wiring substrate 14, and through this beer hole 10, the cash-drawer lead 4 is pulled out by the front face of the wiring substrate 14, and is wired on it. Also on the cash-drawer lead 4 of this front face, tin plating 13 is performed, it pulls out with this tin plating 13, and the beer hole 10 is closed by the lead 4. It connects with a semiconductor chip 1 with the tin plating 13 on the cash-drawer lead 4 wired on the front face of the wiring substrate 14.
[0005] The golden bump 2 is formed in the polar zone (not shown) of a semiconductor chip 1. By [which the golden bump 2 and the tin plating 13 diffuse, and carries out golden-tin-alloy combination by heat-treatment] having wired the golden bump 2 of this semiconductor chip 1 on the front face of the wiring substrate 14, it pulls out, and doubles with the position of lead 4, and the cash-drawer lead 4 on the polar zone of a semiconductor chip 1 and the front face of the wiring substrate 14 is connected electrically.
[0006] Thus, in order to protect the semiconductor chip 1 and the wiring substrate with a ball terminal 31 which were joined, these are closed with the closure resin 15 and the semiconductor equipment 30 is created.
[0007]
[Problem(s) to be Solved by the Invention] However, since the semiconductor chip 1 carried on the wiring substrate with a ball terminal 31 was closed by the closure resin 15 according to the semiconductor equipment 30 which used the conventional wiring substrate with a ball terminal 31 which was shown in drawing 9 , only the part to which the wiring substrate with a ball terminal 31 supports the closure edge of the closure resin 15 became more large-sized than a semiconductor chip 1, and the cost also had the problem start too much. Moreover, since a junction of the golden

bump 2 and the tin plating 13 is performed by the diffusion alloy, sufficient bonding strength is not obtained.
[0008] Therefore, the purpose of this invention is offering the semiconductor equipment using the tape with a ball terminal and it which aim at a miniaturization and a cost cut.
[0009]
[Means for Solving the Problem] In the tape with a ball terminal which has a wiring pattern for connecting a semiconductor chip in order that this invention may realize the purpose stated above The insulating film which has the semiconductor chip, the EQC, or the size not more than it carried, The junction pad for a semiconductor chip junction formed in the 1st field of an insulating film, The ball formation pad for a ball terminal junction which was formed in the 1st field of an insulating film and was connected with the junction pad by lead, It is formed in the 2nd field of an insulating film, and consists of a ball terminal connected with the ball formation pad through the beer hole. a junction pad Tin plating is performed on the front face, and when connecting through a semiconductor chip and a golden bump, the tape with a ball terminal characterized by forming a golden-tin eutectic alloy in a junction interface is offered.
[0010] Moreover, this invention is set on the tape with a ball terminal which has a wiring pattern for connecting a semiconductor chip, in order to realize the above-mentioned purpose. The insulating film which has the semiconductor chip, the EQC, or the size not more than it carried, The junction pad for a semiconductor chip junction formed in the 1st field of an insulating film, The ball formation pad for a ball terminal junction which was formed in the 1st field of an insulating film and was connected with the junction pad by lead, It is formed in the 2nd field of an insulating film, and consists of a ball terminal connected with the ball formation pad through the beer hole. a junction pad Tin plating is performed on the front face, and when connecting with a semiconductor chip through gilding, the tape with a ball terminal characterized by forming a golden-tin eutectic alloy in a junction interface is offered.
[0011] Furthermore, the tape with a ball terminal which has a predetermined wiring pattern in order that this invention may realize the above-mentioned purpose, It consists of a semiconductor chip connected with the predetermined wiring pattern in the tape top with a ball terminal. the tape with a ball terminal The insulating film which has the semiconductor chip, the EQC, or the size not more than it carried, The junction pad to which tin plating was performed on the front face for the semiconductor chip junction formed in the 1st field of an insulating film, The ball formation pad for a ball terminal junction which was formed in the 1st field of an insulating film and was connected with the junction pad by lead, It is formed in the 2nd field of an insulating film, and consists of a ball terminal connected with the ball formation pad through the beer hole. a semiconductor chip The semiconductor equipment characterized by having the passivation layer which covered the plane of composition is offered, exposing only the electrode which has a golden-tin eutectic alloy formed in a junction interface by being joined to a junction pad through a golden bump or gilding, and an electrode.
[0012]
[Embodiments of the Invention] The tape with a ball terminal of this invention and the semiconductor equipment using it are explained in detail below.
[0013] Drawing 1 shows the semiconductor equipment which used the tape with a ball terminal of this invention. This semiconductor equipment 30 is equipped with a semiconductor chip 1 and the tape with a ball terminal 25.
[0014] The tape with a ball terminal 25 is formed in the loading side (following "front face") of the semiconductor chip 1 of the film 3 of mist or a parvus size, and the film 3 from the semiconductor chip 1 carried. It is prepared in the beer hole 10 on the front face of the ball terminal 5 by which heating welding is carried out, and the film 3 from the field (following "rear face") where the junction pad 6 used as the joint with a semiconductor chip 1, the beer hole 10 prepared so that a film 3 might be penetrated, and the loading side of the semiconductor chip 1 of a film 3 are opposite. It has the wiring protective coat 8 of the insulation from which it pulls out and the lead 4 and the cash-drawer lead 4, and the ball formation pad 11 are protected wired so that the ball formation pad 11 and the junction pad 6 which are joined to the fraction inserted into the beer hole

10 of the ball terminal 5, and the ball formation pad 11 might be connected.
[0015] Passivation processing of the base of a semiconductor chip 1 is carried out, and the passivation layer 7 is formed so that a semiconductor chip 1 may have the aluminum electrode 9 prepared so that the bottom (base) may be suited in the position of the junction pad 6 of the tape with a ball terminal 25 and may cover fractions other than this aluminum electrode 9. The junction pad 6 of the tape with a ball terminal 25 is joined to the aluminum electrode 9 of this semiconductor chip 1 by the golden bump 2 etc., and the semiconductor equipment 30 is formed.
[0016] Drawing 2 expands and shows a part for the joint of the aluminum electrode 9 of a semiconductor chip 1, and the junction pad 6 of the tape with a ball terminal 25. What was explained in the above-mentioned drawing 1 , and the same thing are being used for the semiconductor chip 1 and the tape with a ball terminal 25. Below, a junction of a semiconductor chip 1 and the tape with a ball terminal 25 is explained. The golden bump 2 is formed in the aluminum electrode 9 of a semiconductor chip 1 in the shape of a salient. Moreover, tin plating 13 is performed to the junction pad 6 of the tape with a ball terminal 25. Position doubling of the golden bump 2 of this semiconductor chip 1 and the junction pad 6 of the tape with a ball terminal 25 on which tin plating 13 is performed is carried out, and a semiconductor chip 1 is carried on the tape with a ball terminal 25. Next, the junction fixture of a junction tool (not shown) is applied on the periphery of a semiconductor chip 1 and the tape with a ball terminal 25, a semiconductor chip 1 and the tape with a ball terminal 25 are fixed, and the golden bump 2 of a semiconductor chip 1 and the junction pad with the tin plating 13 6 of the tape with a ball terminal 25 are heat-treated with a junction tool. While the tin plating 13 carries out diffused junction to the golden bump 2, a golden-tin eutectic alloy is formed of this heat-treatment and a semiconductor chip 1 and the tape with a ball terminal 25 join physically by it, the aluminum electrode 9 of a semiconductor chip 1 and the junction pad 6 of the tape with a ball terminal 25 are connected electrically.
[0017] Through the cash-drawer lead 4 and the ball formation pad 11, a semiconductor chip 1 and the ball terminal 5 are electrically connected by junction of this semiconductor chip 1 and the tape with a ball terminal 25, and the semiconductor equipment 30 which used the tape with a ball terminal 25 is formed of it.
[0018] Here, although the insulating wiring protective coat 8 which protects the cash-drawer lead 4 and the ball formation pad 11 is formed in order to prevent the electric shunt by contamination of the wiring side (front face) of a film 3, it is not necessarily required.
[0019] Moreover, although diffused junction of the gold well known from the former and tin was performed by the 278-degree C melting point of 90% of the weight of composition of gold, and the temperature of a junction tool was heated at 300 degrees C or more and performed, there was a problem that a film 3 received thermal trauma and deteriorated in this case. On the other hand, in a junction of the tape with a ball terminal 25 of this invention, and the semiconductor chip 1, suppose that gold carries out by the 217-degree C eutectic melting point of 10% of the weight of the 1st eutectic point, and since the temperature of a junction tool can be managed with 230 degrees C, it can prevent the degradation by thermal trauma of a film 3. Thus, in the fillet fraction (not shown) from which gold is 20 - 40 % of the weight, and was extruded outside by the pressure of a junction tool in the junction interface, as for composition of the joined joint, gold is 10 - 15 % of the weight. It cannot grow into composition whose gold exceeds 40 % of the weight even when [thick enough] the temperature of a junction tool is low and the golden bump's 2 thickness is about 20 micrometers like this invention, although it is known that many intermetallic compounds of gold and tin will be formed if gold generally exceeds 40 % of the weight, and a joint will become brittle, but the tape with a ball terminal 25 and the semiconductor chip 1 can be combined certainly.
[0020] As mentioned above, since the base of a semiconductor chip 1 is covered with the passivation layer 7, a passivation is carried out so that it may be hard to react chemically, and composition of the joint of a semiconductor chip 1 and the tape with a ball terminal 25 serves as the ideal eutectic alloy of golden-tin as mentioned above and the tape with a ball terminal 25 and the semiconductor chip 1 can be combined certainly, the closure resin 15 is not needed like the conventional semiconductor equipment 30 (drawing 9). Therefore, as mentioned above, the size

of the tape with a ball terminal 25 is equivalent to the size of a semiconductor chip 1, or can be made into a parvus size rather than it, and can make small the package of the substrates (mother board etc.) which used this semiconductor equipment 30 (drawing 1).
[0021] Drawing 3 shows TAB (Tape Automated Bonding) tape used as the material of the tape with a ball terminal 25 of this invention. The film 3 of the tape with a ball terminal 25 is manufactured on width of face (width of face (35mm or 70mm) of the TAB tape 20, 100mm, or 150mm) of a flexible tape. The case where the TAB tape 20 of 70mm width of face is used for below is explained.
[0022] The polyimide film with a thickness of 40 micrometers - 70 micrometers which has a sprocket hole 16 on the both sides is used for the TAB tape 20. From this TAB tape 20, 4 train creation of the wiring tape 17 on which the wiring is performed to the front-face side of a film 3 can be carried out. The wiring layer of the front face of the wiring tape 17 is formed by copper foil with a thickness of 18 micrometers. This wiring layer carries out the vacuum evaporationo of the copper foil, without using adhesives on a polyimide film, or carries out whether the varnish of a polyimide is covered to copper foil and it is pasted with a polyimide film, or copper foil is pasted up with the adhesives of a polyimide system, and is formed in the front face of the wiring tape 17.
[0023] Furthermore, the ball terminal 5 is formed in the rear face of the wiring tape 17. This ball terminal 5 is formed by forming by inserting, heating and carrying out the fused junction of the solder ball used as the material of the ball terminal 5 etc. to the beer hole 10, or making the powder of solder into the shape of a paste, adding flux after creating the beer hole 10 on the wiring tape 17, making it the high printing paste of viscosity, and printing, heating and carrying out a fused junction to the beer hole 10.
[0024] Moreover, tin plating 13 with a thickness of 0.5 micrometers - 1.5 micrometers is performed to the cash-drawer lead 4 and the junction pad 6 which form the wiring layer of the wiring tape 17 by the non-electric field of tin, electroplating, or vacuum evaporationo.
[0025] The drawing 4 and the drawing 5 show the wiring layer by the side of the front face of the wiring tape 17. Drawing 4 shows the wiring tape 17 on which the aluminum electrode 9 is joined to the semiconductor chip 1 currently installed near the circumference of a semiconductor chip 1. Near the circumference of a film 3, the junction pad 6 is formed corresponding to the aluminum electrode 9 of a semiconductor chip 1, as for the wiring tape 17, the ball formation pad 11 is formed in the shape of a grid at the inside, and the junction pad 6 and the ball formation pad 11 are connected with the cash-drawer lead 4. The grid pitch of this ball formation pad 11 is 0.5mm, 0.75mm, 0.8mm, 1.0mm, or 1.27mm, and is standardized by U.S. JEDEC and the EIAJ standards of Japan.
[0026] Moreover, the ball terminal 5 is formed in the background of the ball formation pad 11. The number of these ball terminals 5 is determined by the number of the aluminum electrodes 9 of a semiconductor chip 1, i.e., the function of a semiconductor chip 1, and usually becomes 200 or more pins by the semiconductor chip 1 for memory at the semiconductor chip 1 40 to 90 pin, and for logics by the semiconductor chip 1 80 to 200 pin, and for a high-speed various functions type custom-made operation.
[0027] Drawing 5 shows the wiring tape 17 on which the aluminum electrode 9 is joined to the semiconductor chip 1 currently installed near the center of a semiconductor chip 1. Corresponding to the aluminum electrode 9 of a semiconductor chip 1, the junction pad 6 is formed near the center of a film 3, as for the wiring tape 17, the ball formation pad 11 is formed in the shape of a grid on the inside or outside (not shown), and the junction pad 6 and the ball formation pad 11 are connected with the cash-drawer lead 4. The ball terminal 5 is formed like drawing 4 .
[0028] The above wiring tapes 17 can be formed with a polyimide film, and are thinly rich in elasticity in this case. For this reason, when it connected and carries in a glass epoxy wiring substrate etc. with the ball terminal 5, the thermal stress produced by the difference of a coefficient of thermal expansion with a glass epoxy wiring substrate can be absorbed, and the heat cycle test performed at -50 degrees C - 150 degrees C can fully also be borne.
[Example]
[0029] One example is given and explained in full detail about the manufacture technique of the

semiconductor equipment 30 which used the tape with a ball terminal 25 of this invention for below.
[0030] respectively, the vacuum evaporationo of titanium with a thickness of 50A, chromium, and the copper is carried out to the aluminum electrode 9 of a semiconductor chip 1 with the input terminal of 144 pins one by one, they carry out a laminating to it, and a thin film is formed. On the thin film, the golden bump 2 with a thickness of 20 micrometers is formed by electroplating. The golden bump's 2 size is 100micrometerx100micrometer, and the size of a semiconductor chip 1 is 8.5mmx8.5mm. The aluminum electrode 9 is arranged 36 (144/4) individuals every near each side of a semiconductor chip 1.
[0031] The wiring tape 17 used for this semiconductor equipment 30 is created using the TAB tape 20 of 35mm width of face. Here, let the film 3 of the wiring tape 17 be the same size as a semiconductor chip 1. Therefore, as shown in drawing 3 , the wiring tape 17 of four trains can be created from the TAB tape 20.
[0032] In the wiring tape 17 which was shown in drawing 4 , the pitch of the ball formation pad 11 on the wiring tape 17 is set to 0.65mm, and a diameter is set to 0.30mm. The configuration of the ball formation pad 11 is made into 12 piece x12 piece (=144 piece) matrix structure. Therefore, between the ball formation pads 11 in the outermost periphery, although the spacing which takes about the cash-drawer lead 4 of a maximum of five is needed In the case of this example, between the ball formation pads 11 in this outermost periphery It is set to (0.65-0.3) / 5.5**0.064mm in consideration of the diameter of the ball formation pad 11, and since the minimum value of a spacing which takes about the cash-drawer lead 4 of five is 0.05mm, this condition can fully be fulfilled and a leading-about wiring of the cash-drawer lead 4 can be performed easily.
[0033] By vacuum evaporationo, copper of 99.9999% of purity is made into a copper layer with a thickness of 3 micrometers, and the wiring on the wiring tape 17 forms it in a polyimide film with a thickness of 40 micrometers. thus, a detailed wiring of 50 micrometer pitch [in phot chemical etching by using the high-grade copper of 6N] -- provoking -- things are known The front face and the side face of a pattern in which it was etched by copper purity being high at the time of wiring formation according [there are few copper organization defects and] to phot chemical etching are smooth, the pattern of uniform width of face is formed covering an overall length, and, for this reason, this can seldom do the defect of a wiring piece etc. Moreover, it is because abnormalities seldom arise in a surface plating manipulation of the tin plating 13 etc. and it is hard to generate the shunt of a pattern, since the pattern is smooth.
[0034] 13 layers of tin plating with a thickness of 0.6 micrometers were formed with non-electric-field tin plating after above-mentioned wiring formation and on [whole] the copper wiring. As shown in drawing 4 , this copper wiring forms the cash-drawer lead 4 inside from the junction pad 6, and it connects with the ball formation pad 11 of 12x12 arrays, and it is formed. The pitch of the junction pad 6 is the 0.22 samemm as the golden bump's 2 pitch, and the width of face of the junction pad 6 is one half of 50 micrometers of the golden bump's 2 width of face.
[0035] Next, the beer hole 10 of the diameter of 0.25mm was formed in the position which counters with the ball formation pad 11 by the carbonic acid gas laser with a galvanomirror from the rear face at this wiring tape 17. This carbonic acid gas laser with a galvanomirror performs the energy condensation and beam-shape ** by the condenser, positions this formation beam by the high-speed electric reflective mirror, and carries out the vaporization elimination of the polyimide of the target position. By this carbonic acid gas laser with a galvanomirror, since about 4000 beer holes 10 can be made in 1 minute, opening of 144 beer holes 10 like this example can be carried out in about 2.16 seconds. You may perform formation of this beer hole 10 before tin plating.
[0036] The solder ball used as the ball terminal 5 is formed in the beer hole 10 by the soldering-paste printing reflow method. With a metal mask with a thickness of 250 micrometers, the eutectic-solder paste of 63Sn/37Pb is used, a soldering paste is printed, after that, it heats in a soldering paste for about 10 seconds at about 250 degrees C with a general-purpose reflow machine, a soldering paste is melted to it, and a solder ball is formed in it. This method can carry the conventional solder ball and can form a solder ball on the wiring tape 17 more cheaply than the technique of carrying out melting. In this method, 144 solder balls with a height of 0.2mm can be

formed simultaneously, and in the TAB tape 20, it can print simultaneous four trains [four], four trains [eight], or four trains [12], and a solder ball can be formed.
[0037] Although the wiring tape 17 is manufactured on the TAB tape 20 with a length of 50m as mentioned above, the number of these wiring tapes 17 becomes 2000 {/(8.5+alpha)} x4 = abbreviation. [50000]
[0038] Thus, the junction tool by which doubles the position of the junction pad 6 of the wiring tape 17 and the position of the golden bump 2 of a semiconductor chip 1 with the splicing machine with an image-recognition alignment device, and the heating hold was carried out in the formed TAB tape 20 at about 230 degrees C was applied from the rear face of the wiring tape 17, and the heating junction was performed for about 3 seconds. The heater for heating is formed on a junction tool base, the thermocouple is embedded near the base, and temperature is controlled. Since a junction tool was contacted from the rear face of the wiring tape 17 with a thickness of 40 micrometers, although 230-degree C heat traveled to the joint, on it, heat trauma does not happen to a polyimide film, and a joint is also torn off, and 10g per junction pad 6 or more of intensities was obtained.
[0039] Thus, as a result of investigation of the junction cross section by EPMA, according to the junction interface, gold is 30 - 40 % of the weight, and it made composition of the joined joint clear that gold is 10 - 15 % of the weight in the fillet fraction extruded outside by the pressure of a junction tool. In a fillet fraction, it is equivalent to the eutectic of 217 degree-C melting point in the 2 yuan system equilibrium diagram of golden-tin, a junction reaction begins by this eutectic melting point, it is extruded on the outskirts by the pressure of a junction tool, and it is judged as what gold diffused further and golden composition weight % went up by the junction interface after that.
[0040] From the above results of an investigation, by the junction interface, it became clear that gold has the heat-resistant temperature of 300 degrees C by 30 - 40% of the weight of composition, and the joint did not fracture to 300 degrees C in the actual tension test.
[0041] Thus, flux is used and carried in a mother board, the manufactured semiconductor equipment 30 is put into 230-degree C reflow kiln for about 10 seconds, and it connects on a mother board with the solder ball formed in the beer hole 10. The -55 degrees C - 150 degrees C heat cycle test machine performed the thermal stress load test of 1000 cycle for this. Consequently, fracture of a solder ball did not accept by the verification by the electric check after the examination.
[0042] As mentioned above, although one example of the tape with a ball terminal 25 of this invention was explained, you may use what performed electric nickel plating to the aluminum electrode 9 by the thickness of 20 micrometers, and gave electric gilding by the thickness of 1.0 micrometers on it instead of the golden bump 2. By this, golden thickness is made to 1/20, and a cost can be further made low. In this case, in the joint, although gold was required 30 to 40% of the weight, to the tin plating 13 with a thickness of 0.3 micrometers, things made gold clear from the experimental result that what is necessary is just 0.5 micrometers in thickness.
[0043] In the above-mentioned example, you may form the beer hole 10 by the punching. In this case, on a polyimide film, the adhesives of 10 micrometer thickness are applied and the beer hole 10 is formed by the punching after solvent xeransis. Then, the copper foil of 18 micrometer thickness is made to rival so that a roll laminator may close the beer hole 10. It is not necessary to use the expensive carbonic acid gas laser with a galvanomirror, and costs, such as a facility, do not start by this.
[0044] In the above-mentioned example, as shown in drawing 5 , you may arrange the position of the golden bump 2 of a semiconductor chip 1 in the position of the junction pad 6 of the wiring tape 17. Moreover, it may change to a polyimide film and a polyester resin tape, a Teflon-resin tape, or an acrylic resin combination low elastic epoxy resin film may be used. Furthermore, thickness of a polyimide film is thinly made to about 25 micrometers in consideration of the differentiation among coefficients of thermal expansion, such as a dynamic-viscoelasticity coefficient (about 3.0giga pascal) of a polyimide film, the semiconductor chip 1, and a mother board, etc. Moreover, thickness of a polyimide film can be thickened from viewpoints, such as a

bond strength of a bond part, to about 75 micrometers.
[0045] Furthermore, thickness of the copper foil used for the wiring can be thickened to about 25 micrometers. By this, although stress absorptance, such as thermal stress, declines, a workability comes be made cheaply low. Moreover, you may use the alloy copper foil of composition of the 2.0 % of the weight-copper of zirconiums instead of this copper foil. According to this alloy copper foil, an intensity will increase about 30% rather than a pure-copper foil. Furthermore, you may use 90Pb / 10Sn solder for a creation of a solder ball.
[0046] Drawing 6 shows other examples of the semiconductor equipment 30 which used the tape with a ball terminal 25 of this invention. This is changed to the golden bump 2 shown in drawing 2 , and the gilding 12 with a thickness of 1.0 micrometers is used for it. Although between a semiconductor chip 1 and the tapes with a ball terminal 25 became very narrow when it was made this appearance, also in a thermal stress load test, there was no influence by thermal stress absorption of the tape with a ball terminal 25.
[0047] In the semiconductor equipment 30 shown in drawing 6 , tin plating 13 may be performed to the aluminum electrode 9 side of a semiconductor chip 1, and gilding 12 may be given on the junction pad 6 of the tape with a ball terminal 25.
[0048] Drawing 7 shows the semiconductor equipment 30 which used the tape with a ball terminal 25 as the double-sided wiring tape. As the tape with a ball terminal 25 may be used as a double-sided wiring tape and shown in drawing 7 in this case, in order to connect a wiring of the front face and rear face of the tape with a ball terminal 25, respectively, beer plating 18 can be performed to the side face of the beer hole 10, and the ball terminal 5 can be formed on it.
[0049] Drawing 8 shows other examples of drawing 7 . It pulls out to the beer plating 18 shown in drawing 7 with the rear face of the tape with a ball terminal 25, lead 19 is connected to it, and the tape with a ball terminal 25 of this invention in drawing 8 connects a ball formation pad (not shown) to the cash-drawer lead 19, and forms the ball terminal 5 on the ball formation pad.
[0050]
[Effect of the Invention] Since the miniaturization and the cost cut were aimed at since closure by the closure resin of the semiconductor chip and the tape with a ball terminal which are carried was lost according to the tape with a ball terminal of this invention, and the semiconductor equipment using it as stated above, and connection of a semiconductor chip and a wiring pattern was joined by the golden-tin eutectic alloy, a bonding strength can be made into size and a reliability can be raised.

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] In the tape with a ball terminal which has a wiring pattern for connecting a semiconductor chip The insulating film which has the semiconductor chip, the EQC, or the size not more than it carried, The junction pad for a semiconductor chip junction formed in the 1st field of the above-mentioned insulating film, The ball formation pad for a ball terminal junction which was formed in the 1st above-mentioned field of the above-mentioned insulating film, and was connected with the above-mentioned junction pad by lead, It is formed in the 2nd field of the above-mentioned insulating film, and consists of a ball terminal connected with the above-mentioned ball formation pad through the beer hole. the above-mentioned junction pad The tape with a ball terminal characterized by forming a golden-tin eutectic alloy in a junction interface when tin plating is performed on the front face and it connects through the above-mentioned semiconductor chip and a golden bump.
[Claim 2] The above-mentioned insulated film is a tape with a ball terminal according to claim 1 which is the thickness of 25 micrometers - 75 micrometers.
[Claim 3] The above-mentioned ball terminal is a tape with a ball terminal according to claim 1 which is the eutectic solder of 63Sn/37Pb.
[Claim 4] The above-mentioned golden bump is a tape with a ball terminal according to claim 1 which is a salient with a thickness of 10 micrometers - 20 micrometers.
[Claim 5] The golden-tin eutectic alloy of the above-mentioned interface is a tape with a ball terminal according to claim 1 which gold is 10 - 40 % of the weight, tin remains and is all weights %.
[Claim 6] In the tape with a ball terminal which has a wiring pattern for connecting a semiconductor chip The insulating film which has the semiconductor chip, the EQC, or the size not more than it carried, The junction pad for a semiconductor chip junction formed in the 1st field of the above-mentioned insulating film, The ball formation pad for a ball terminal junction which was formed in the 1st above-mentioned field of the above-mentioned insulating film, and was connected with the above-mentioned junction pad by lead, It is formed in the 2nd field of the above-mentioned insulating film, and consists of a ball terminal connected with the above-mentioned ball formation pad through the beer hole. the above-mentioned junction pad The tape with a ball terminal characterized by forming a golden-tin eutectic alloy in a junction interface when tin plating is performed on the front face and it connects with the above-mentioned semiconductor chip through gilding.
[Claim 7] The above-mentioned insulated film is a tape with a ball terminal according to claim 6 which is the thickness of 25 micrometers - 75 micrometers.
[Claim 8] The above-mentioned ball terminal is a tape with a ball terminal according to claim 6 which is the eutectic solder of 63Sn/37Pb.
[Claim 9] The above-mentioned gilding is a tape with a ball terminal according to claim 6 which is the thickness of 0.5 micrometers - 1.5 micrometers.
[Claim 10] It consists of a semiconductor chip connected with the tape with a ball terminal which has a predetermined wiring pattern, and the wiring pattern predetermined [above-mentioned] in the above-mentioned tape top with a ball terminal. the above-mentioned tape with a ball terminal

The insulating film which has the semiconductor chip, the EQC, or the size not more than it carried, The junction pad to which tin plating was performed on the front face for the semiconductor chip junction formed in the 1st field of the above-mentioned insulating film, The ball formation pad for a ball terminal junction which was formed in the 1st above-mentioned field of the above-mentioned insulating film, and was connected with the above-mentioned junction pad by lead, It is formed in the 2nd field of the above-mentioned insulating film, and consists of a ball terminal connected with the above-mentioned ball formation pad through the beer hole. the above-mentioned semiconductor chip Semiconductor equipment characterized by having the passivation layer which covered the plane of composition while exposing only the electrode which has a golden-tin eutectic alloy formed in a junction interface by being joined to the above-mentioned junction pad through a golden bump or gilding, and the above-mentioned electrode.

[Translation done.]

引出しリード１９が接続され、その引出しリード１９にボール形成パッド（図示せず）を接続して、そのボール形成パッド上にボール端子５を形成したものである。

【００５０】

【発明の効果】以上述べた通り、本発明のボール端子付テープおよびそれを用いた半導体装置によれば、搭載される半導体チップとボール端子付テープとの封止樹脂による封止をなくしたので、小型化とコストダウンを図り、また、半導体チップと配線パターンの接続を金－錫共晶合金で接合したので、接合強度を大にして信頼性を高めることができる。

【図面の簡単な説明】

【図１】本発明によるボール端子付テープを使用した半導体装置の実施の一形態を示す概略図である。

【図２】本発明によるボール端子付テープと半導体チップの接合部を示す概略図である。

【図３】本発明によるボール端子付テープが作成されるＴＡＢテープを示す概略図である。

【図４】本発明によるボール端子付テープの配線を示す概略図である。

【図５】本発明によるボール端子付テープの配線を示す概略図である。

【図６】本発明によるボール端子付テープと半導体チップの接合部を示す概略図である。

【図７】本発明によるボール端子付テープと半導体チップの接合部を示す概略図である。

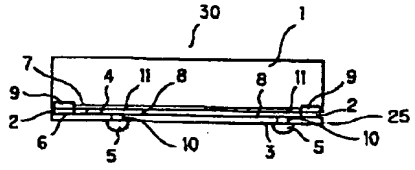
【図８】本発明によるボール端子付テープと半導体チップの接合部を示す概略図である。

【図９】従来のボール端子付基板と半導体チップの接合部を示す概略図である。

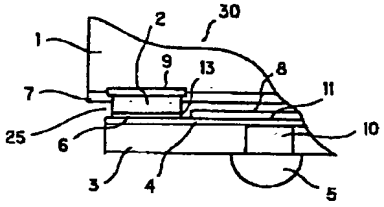
【符号の説明】

１　半導体チップ
２　金バンプ
３　フィルム
４、１９　引出しリード
５　ボール端子
６　接合パッド
７　パッシベーション膜
８　配線保護膜
９　アルミ電極
１０　ビア穴
１１　ボール形成パッド
１２　金めっき
１３　錫めっき
１４　配線基板
１５　封止樹脂
１６　送り穴
１７　配線テープ
１８　ビアめっき
１９　引出しリード
２０　ＴＡＢテープ
２５　ボール端子付テープ
３０　半導体装置
３１　ボール端子付配線基板

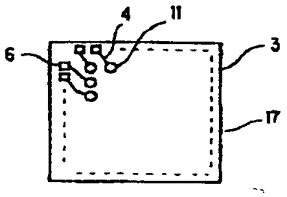
【図１】



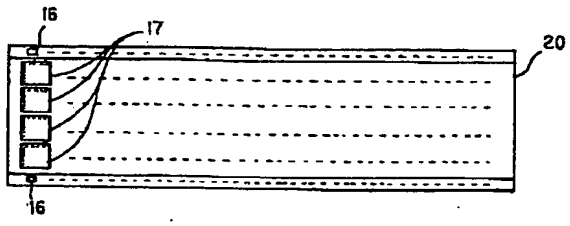
【図２】



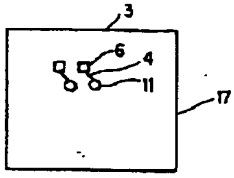
【図４】



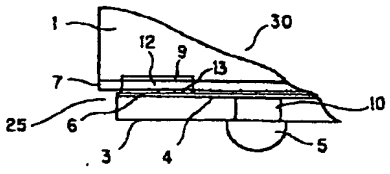
【図３】



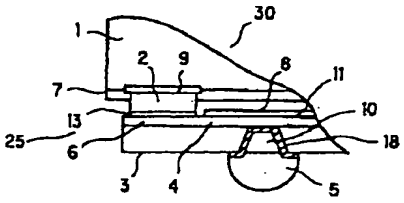
【図５】



【図６】



【図７】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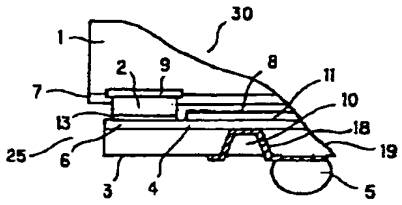
【図８】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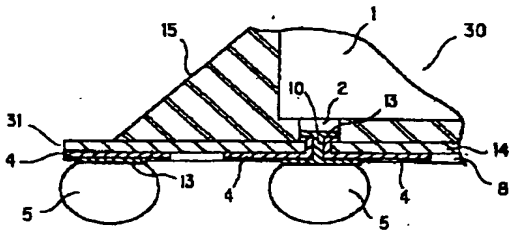
【図９】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